UNIT IV

NON-LINEAR DATA STRUCTURES

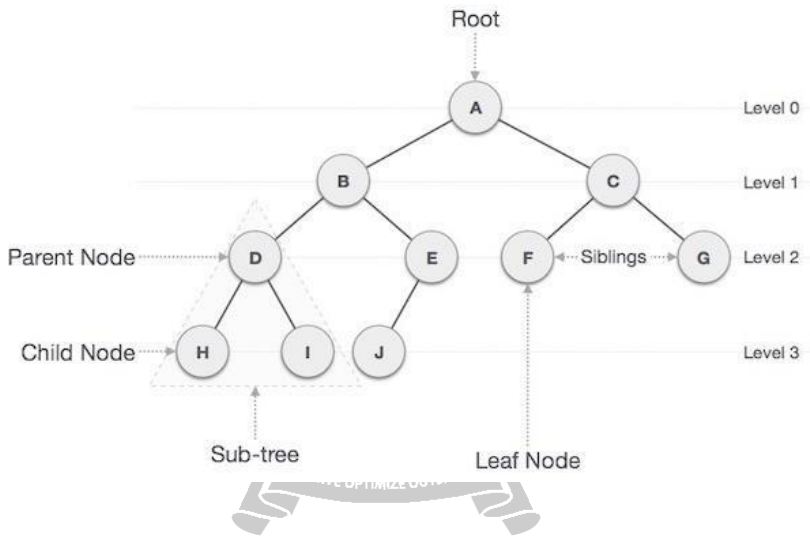
Trees – Binary Trees – Binary tree representation and traversals –Binary Search Trees – Applications oftrees. Set representations – Union-Find operations. Graph and its representations – Graph Traversals.

TREES STRUCTURE:

Definition:

Tree is a non-linear data structure. It organized the data in hierarchical manner. A tree is a finite set of oneor more nodes such that there is a specially designated node called the root node and root node can have zeroor more sub trees T1,T2,T3,… .....,Tn. Each of whose roots are connected by a directed edge from root R.

Tree is collection of nodes in which the first node is called root and root has many number of sub tree T1,T2, T3… Tn.



Terms:

1. **Root**
   A node which does not have a parent is called as root node.
2. **Node**
   Each data element in the tree is called as node.
3. **Leaf node**
   A node which does not have any children is called leaf node.
4. **Siblings**
   A child of same parent is called sibling.
5. **Path**
   A path from node n1 to nk is defined has sequence of nodes n1, n2, n3…..... nk. Such that ni is a parent

of ni +1.Example: A->B->E->J

6. **Length for a path**
   Number of edges in the path.

Example: Consider path from A to J is 3

7. **Degree**
   Number of sub trees of the node is called degree.
8. **Level**
   Root is at level 1 then i+s children are at level

2+1Example: level

9. Depth

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For any node n, the depth n is length of unique path from root to n.

10. Height

For any node n, the height of node n is the length of longest path from n to left.

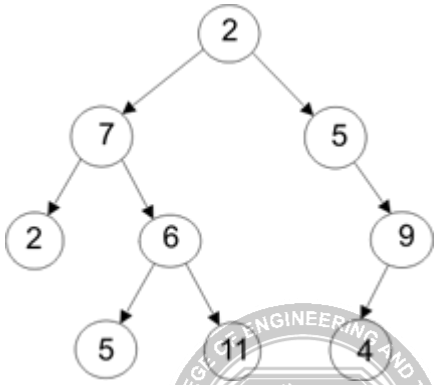
11. Forest

Collection of tree node is known as forest.

BINARY TREE ADT

Definition: -

Binary Tree is a special type of tree in which no node can have most two children. Typically, child nodesof a binary tree on the left is called left child and node on right is called right child. Maximum number



of nodes
at level i of a binary tree is 2^{i-1}.

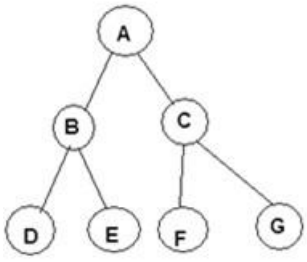
A simple binary tree of size 9 and height 3, with a root node whose value is 2. The above tree is neithera sorted nor a balanced binary tree

Representation of tree.

1. Sequential representation or array representation.
2. Linked representation.

1. Sequential representation or array representation.

The elements are represented using arrays. For any element in position i, the left child is in position 2i, the right child is in position (2i + 1), and the parent is in position (i/2).



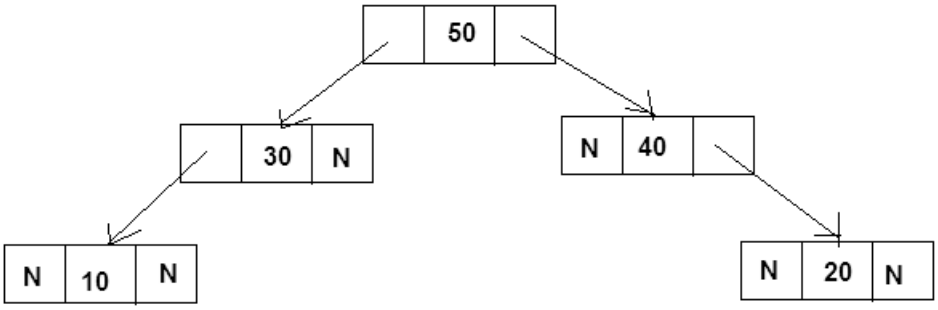
A	B	C	D	E	F	G
0	**1**	**2**	**3**	**4**	**5**	**6**

Array representation of Binary Tree

2. Linked representation

The elements are represented using pointers. Each node in linked representation has three fields, namely,

* Pointer to the left subtree
* Data field
* Pointer to the right subtree



Linked representation of Binary Tree

Routine of creating tree using linked list.struct tree

```
{
int data;
strct tree *leftchild;
 strct tre*rightchild;
};
```